REMARKS

Claims 1-31 were presented for examination and remain pending. In an Office Action dated March 22, 2004, claims 1-31 were rejected. The specification was objected to. Claims 2, 16, and 18 were objected to. The drawings containing Figs. 2 and 12 were objected to.

The specification is herein amended. Claims 1, 2 and 18 are herein amended. Figures 2 and 12 are herein amended. The amendments to the specification, claims, and drawings add no new matter.

Applicants thank Examiner for examination of the claims, and the subsequent interview of July 19, 2004, the substance of which was previously summarized by Examiner on July 23, 2004. Applicants now request reconsideration in light of the below remarks and allowance of pending claims.

I. AMENDMENTS TO THE DRAWINGS

In paragraph 2 of the Office Action, Examiner objects to the drawings because of informalities. More specifically, Figs. 2 and 12 were missing labels referred to in the specification. These labels have been added by amendment herein. Thus, Applicants respectfully submit that the drawings containing Figs. 2 and 12 should no longer be objected to.

II. AMENDMENTS TO THE SPECIFICATION

In paragraph 3 of the Office Action, Examiner objects to the specification because of informalities. These minor, nonsubstantive errors have been corrected by amendment herein (e.g., changing "1:N power combiners" to "N:1 power combiners"). Thus, Applicants respectfully submit that the specification should no longer be objected to.

III. CLAIM OBJECTIONS

In paragraph 4 of the Office Action, Examiner objects to claims 2, 16, and 18 because of informalities. Claims 2 and 18 have been amended herein, consistent with Examiner's suggestions, to clarify the claims. Applicants submit that dependent claim 16, however, is clear as originally drafted. Since the phrase "the subbands" of claim 16 has antecedent basis in the phrase "composite optical signal having at least two subbands

of information" in independent claim 1, it is not necessary to change "subbands" to "optical subbands" as suggested by Examiner. Moreover, the phrase "subbands" is consistent with the remaining claims (e.g., claim 9). Thus, Applicants respectfully submit that claims 2, 16, and 18 should no longer be objected to.

IV. AMENDMENTS TO THE CLAIMS & CLAIM REJECTIONS

Claims 1, 2, and 18 have been amended for reasons unrelated to the claim rejections. Claims 2 and 18 were amended responsive to objections as discussed above. In addition, claims 1 and 18 have been amended to clarify that the optical splitter need not perform WDM demultiplexing functions. This is not a narrowing amendment since the amendment in fact broadens claims 1 and 18.

In paragraph 7 of the Office Action, Examiner rejects claim 1 under 35 U.S.C. §103 over *10-Gb/s Subcarrier Multiplexed Transmission Over 490 km of Ordinary Single-Mode Fiber Without Dispersion Compensation* by Sargis et al. ("Sargis et al.") in view of U.S. Patent No. 5,140,453 by Tsushima et al. and *WDM Coherent Optical Star Network* by Glance et al. ("Glance et al."). Applicants respectfully traverse this rejection.

In general, while claim 1 uses at least two heterodyne receivers to recover a composite signal of at least two subbands following an optical splitter, Sargis et al., Tsushima, and Glance et al. merely disclose: direct detection receivers aided by wave length-selective filter; a single receiver to receive a single-frequency signal; and a single receiver aided by an electronic IF filter, respectively. These points were advanced by Applicants' attorneys during the interview with Examiner, but rather than agree or disagree, Examiner preferred to have these points entered into the record through the present Remarks.

Independent claim 1, as amended, recites an optical communications system for communicating information comprising:

> a receiver subsystem comprising:
>
> an optical splitter for splitting a composite optical signal having at least two subbands of information and at least one tone into at least two optical signals; and
>
> at least two heterodyne receivers, each heterodyne receiver coupled to receive one of the optical signals from the optical splitter for recovering

information from one of the subbands contained in the optical signal, each heterodyne receiver comprising:

a heterodyne detector for mixing an optical local oscillator signal with the optical signal to produce an electrical signal which includes a frequency down-shifted version of the subband and the tone of the optical signal; and

a signal extractor coupled to the heterodyne detector for mixing the frequency down-shifted subband with the frequency down-shifted tone to produce a frequency component containing the information.

Advantageously, the system as recited in claim 1 uses heterodyne detectors for improved sensitivity and optical bandwidth utilization relative to, for example, direct detection techniques. Furthermore, the wavelength deiscrimination of heterodyne detectors reduces the need for extensive front-end processing such as wavelength discrimination by the optical splitter, allowing the use of power splitters rather than wavelength division multiplexing (WDM) demultiplexers in some cases.

A. Sargis et al.

By contrast, Sargis et al. discloses direct detection receivers aided by a wave filter. As shown in FIG. 1, each OC-48 clock recovery receiver follows a fiber Fabry-Perot filter. (See Sargis et al., at p. 2). These receivers are incoherent receivers capable only of direct detection.

However, Sargis et al. fails to disclose or suggest at least two heterodyne receivers as recited in claim 1. First, Examiner acknowledges that Sargis et al. does not expressly disclose heterodyne receivers. Indeed, the simplistic direct detectors of Sargis et al. are not wavelength discriminant as are the heterodyne detectors of claim 1. Instead, the direct detectors require wavelength selectivity provided by the Fabry-Perot filters. (See Sargis et al., at p. 1). Second, Sargis et al. actually teaches away from the use of heterodyne detectors. As stated in the second paragraph fo the introduction, "[o]ur implementation of SCM reduces the problems of receiver complexity...by employing a novel receiver architecture which...allows the use of direct detection." Thus, not only does Sargis et al. fail to suggest the use of heterodyne detectors, Sargis et al. explicitly states that one of the objectives is to allow a fundamentally different architecture relying upon direct detection.

Tshushima et al. and Glance et al. do not cure the deficiency of heterodyne receivers. Examiner points to these references as disclosing heterodyne receivers to reject claims 1 in combination with Sargis et al. However, this is an improper combination. References cannot be properly combined if the combination is counter to the objectives of the references. (See MPEP 2143.01). Here, since Sargis et al. has the goal of providing direct detection, it cannot be properly combined with a reference that replaces that goal of direct detectors with heterodyne receivers. Therefore, claim 1 is patentable over Sargis et al. either alone or in combination with Tsushima et al. and/or Glance et al.

B. Tsushima et al.

Tsushima et al. discloses a single receiver to receive a single-frequency signal. More generally, an optical receiving method receives a signal having polarization diversity or different polarization planes substantially perpendicular to each other. (Tsushima et al., at Abstract). The combined signal is subjected to heterodyne detection before being split according to polarization. (See Id.).

However, Tsushima et al. fails to cure the deficiencies of Sargis et al. While claim 1 recites at least two heterodyne receivers to receive different subbands, Tshushima et al. uses a single heterodyne receiver to detect a single frequency signal of mixed polarity. Furthermore, Examiner has acknowledged that Sargis et al. fails to expressly disclose a signal extractor as claimed, but has not pointed to any disclosure of a signal extractor in Tsushima et al. to cure this deficiency. Thus, Examiner has not made a prima facie case of obviousness, which requires that the prior art as combined teach each and every element of the claim. (See MPEP 2142; MPEP 2143). Therefore, claim 1 is patentable over Tsushima et al. either alone or in combination with other references.

C. Glance et al.

Glance et al. discloses a single receiver aided by an electronic IF filter. A WDM optical signal is received from a star coupler into a balanced mixed receiver which uses a heterodyne process to receive the entire composite signal. (Glance et al., at p. 69). Subsequently, the IF filter provides electronic selection of a desired channel by tuning the

LO frequency to the value that centers the wanted channel within the bandwidth of the IF filter. (Id.).

However, Glance et al. fails to cure the deficiencies of Sargis et al. and/or Tsushima et al. While claim 1 recites a composite optical signal having at least two subbands of information, Glance et al. discloses a WDM system with inferior bandwidth utilization since WDM requires a carrier for each band with greater separation between bands relative to subbands using a single carrier. Additionally, Examiner has not made a prima facie case of obviousness as discussed above, since Examiner has acknowledged that Sargis et al. fails to expressly disclose a signal extractor as claimed and has not pointed to any disclosure of a signal extractor in Glance et al. to cure this deficiency. Therefore, claim 1 is patentable over Glance et al. either alone or in combination with other referneces.

Furthermore, independent claim 18, having similar limitations to claim 1, is thus patentable for at least the same reasons as discussed above. Moreover, since claims 2-17 and claims 19-31 depend from independent claims 1 and 18 respectively, in addition to claiming additional novel features, those claims are patentable for at least the same reasons as the independent claims.

CONCLUSION

In sum, Applicants respectfully submit that claims 1-31, as presented herein, are patentably distinguishable over the prior art of record. Therefore, Applicants request allowance of these claims. In addition, Applicants respectfully invite Examiner to contact Applicants' representative at the number provided below if Examiner believes it will help expedite furtherance of this application.

RESPECTFULLY SUBMITTED,
TING K. YEE ET AL.

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